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REMARKS

In the Office Action dated May 8, 2002, the Examiner rejects claims 1-7 under 35 U.S.C. §102 (b) as being anticipated by Schmitt. With this Amendment, claims 1-3 and 5-7 have been amended, and new claims 8-20 have been added. For the foregoing reasons, Applicant's invention as defined by the claims is not anticipated or rendered obvious by the cited reference.

Claim 1 has been amended to more distinctly claim the invention therein. Claim 1 now specifies that the plurality of light emitting diodes are a plurality of closely-spaced light emitting diodes extending between the opposite ends of the bulb portion. Minor stylistic changes have been made in the remainder of claim 1. It is respectfully submitted that claim 1 is not anticipated or rendered obvious by Schmitt. Schmitt does not teach a plurality of light emitting diodes (LEDs), as proposed by the Examiner. The lamps of Schmitt, such as lamp 152, are identified in Schmitt as incandescent or tungsten halogen lights. (Schmitt, col.1, ll. 56-57; col.2, ll. 19-22; col. 4, ll. 24-27). Schmitt teaches away from using the relatively monochromatic light offered by individual LEDs by emphasizing that the frequencies of light generated by incandescent and halogen lights are desirable for the warmth, sparkle and brilliance they add to the objects displayed by Schmitt's illumination system when contrasted to the smaller frequency spectrum offered by fluorescent tubes. (Col. 4, line 68-col. 5, line 3; col. 8, ll. 19-22). As the Examiner doubtless knows, incandescent and tungsten halogen lights emit a light with more red and less blue than fluorescent tubes. For the foregoing reasons, Schmitt does not teach or suggest using a plurality of LEDs.

Further, even if Schmitt suggested using LEDs as its lamps, Schmitt does not teach or suggest a plurality of closely-spaced light emitting diodes extending between the opposite ends of the bulb portion, which is shown by example in Applicants' Figures 1 and 2. A critical feature of Schmitt is the existence of spaced-apart light sources as exhibited by the presence of this element in each claim of the patent. The specification explains that adequate separation assures maximum reflective angles with respect to the object being displayed. (Col. 4, ll. 62-65; col. 6, ll. 24-28). Figure 2, by example, illustrates three spaced-apart lamps 50 mounted in spaced-apart sockets 44. Thus, Schmitt teaches away from a plurality of closely-spaced light emitting diodes extending between the opposite ends of the bulb portion. Claims 2 and 3, which depend from

claim 1, have also been clarified. The features of claim 2 are now stated more clearly, indicating that each of the pair of end caps is shaped to be coupled with a fluorescent light tube socket. Similarly, claim 3 now clarifies that each of the pair of end caps is an electrical bi-pin connector. For the foregoing reasons, the invention as defined by claim 1 and its dependent claims 2-4 is not anticipated or rendered obvious by Schmitt.

The Examiner also rejects claim 5 and its dependent claims 6 and 7 as being anticipated by Schmitt. Claim 5 has been amended to state that the improvement comprises a plurality of closely-spaced light emitting diodes disposed inside a bulb portion of the light tube and in electrical communication with a pair of end caps coupled to opposed ends of the bulb portion and engageable with the light tube socket. Claim 5 also states that the plurality of light emitting diodes are operable to illuminate in response to electrical current delivered by the fluorescent light fixture. Dependent claims 6 and 7 have been amended to correct typographical errors. Claim 7 has been revised to depend from claim 6 and to clarify that each of the plurality of light emitting diodes is mounted at an angular off-set from the circuit board. As the Applicants explained with respect to claim 1, Schmitt teaches away from using LEDs as lamps and, even if LEDs were suggested by Schmitt, Schmitt teaches away from using closely-spaced light emitting diodes. Thus, the invention as defined by claim 5 and its dependent claims 6 and 7 is not anticipated or rendered obvious by Schmitt.

In addition to the reasons set forth with respect to claim 5, from which claim 6 depends, it is respectfully submitted that Schmitt does not teach or suggest that the plurality of light emitting diodes is mounted to a circuit board. The Examiner states that element 150 is a circuit board. However, the reference number 150, as shown in Fig. 9, is directed to spaced-apart light sockets 150. Schmitt neither teaches nor suggests mounting the lamps to a circuit board. Thus, the invention as defined by claim 6 is also patentably distinct from Schmitt.

With this Amendment, new claims 8-20 have been added. Claims 8-13 depend from claim 1 and are similarly allowable. Claims 14-20 depend from claim 5 and are allowable for the reasons set forth with respect to claim 5.

In addition to being allowable by dependency from claim 1, claim 8 and its dependent claims 9 and 10 include the feature that the plurality of light emitting diodes is mounted

on at least one circuit board. As stated with respect to claim 6, this feature is neither taught nor suggested by Schmitt. Claim 9 additionally adds the feature that the plurality of light emitting diodes is mounted on only one side of the at least one circuit board to emit light toward only one side of the bulb portion. This feature is similarly not taught or suggested by Schmitt. Schmitt requires an elongate reflector 30, 70, 98 or 136 for the precise reason the disclosed lamps of Schmitt cannot be mounted to emit light in a particular direction. For the same reason, claim 10, which depends from claim 9 and states that the radiation pattern of light from each of the plurality of light emitting diodes is centered at a 90° angle relative to the at least one circuit board, is neither taught nor suggested by Schmitt.

Schmitt also fails to teach the feature of claim 11 that each of the plurality of light emitting diodes is a white LED. In fact, even if Schmitt suggested using an LED, Schmitt teaches away from using only white LEDs. White LEDs, a relatively new development many years after the issuance of Schmitt, emit light in a very narrow frequency range. As mentioned previously, Schmitt emphasizes the benefits of the wider frequencies of light generated by incandescent and halogen lights for the warmth, sparkle and brilliance they add to displayed objects. (Col. 4, line 68-col. 5, line 3; col. 8, ll. 19-22).

Claim 12 specifies that the plurality of light emitting diodes is displaced substantially continuously between the opposite ends of the bulb portion. As previously discussed, Schmitt fails to teach or suggest arranging the disclosed lamps, which are not LEDs, in any arrangement other than closely-spaced.

With respect to claim 13, Schmitt also fails to teach or suggest the feature that each of the plurality of light emitting diodes is arranged into one of a plurality of equidistantly-spaced light emitting diode banks, each of the plurality of light emitting diode banks comprising at least two light emitting diodes. Light emitting diode banks comprising at least two light emitting diodes, even if Schmitt suggested using LEDs as lamps, would not be obvious to one of skill in the art because Schmitt teaches the need for a plurality of light sources spaced apart from one another. (Col. 8, ll. 13-15). To do these, each spaced-apart socket receives one lamp. (Figs. 2, 6, 8, 9).

Claim 15 depends from claim 5 and adds the features that the electric current is a

direct current signal and the improvement also includes a rectifier for converting an alternating current signal from the fluorescent light fixture to the direct current signal. Claim 16 depends from claim 15 and adds the feature to the improvement of a pulse-width modulating circuit for receiving the direct current (DC) signal and supplying a resulting modulated signal to the plurality of light emitting diodes. In addition to the reasons set forth with respect to claim 5, claims 15 and 16 are allowable because Schmitt fails to teach or suggest either of these features. Schmitt requires a transformer 54 to reduce the voltage supplied from an alternating current (AC) source. The lamps receive this reduced-voltage AC supply. A DC supply is neither taught nor suggested.

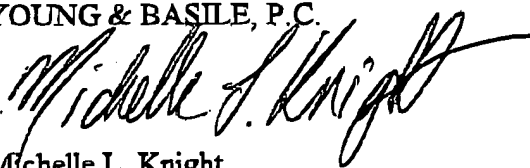
Claim 17 depends from claim 5 and includes the feature that each of the plurality of light emitting diodes is a white LED, which is neither taught nor suggested by Schmitt for the reasons set forth with respect to claim 11. Claim 18 depends from claim 5 and teaches that each of the plurality of light emitting diodes is arranged into one of a plurality of equidistantly-spaced light emitting diode banks, each of the plurality of light emitting diode banks comprising at least two light emitting diodes. As explained with respect to claim 13, this feature is neither taught nor suggested by Schmitt. Claim 19 adds the feature to the improvement of claim 6 that the plurality of light emitting diodes is mounted on only one side of the circuit board to emit light toward only one side of the bulb portion. As explained with respect to claim 9, this feature is not taught or suggested by Schmitt. Finally, claim 20 depends from claim 19 and states that the radiation pattern of light from each of the plurality of light emitting diodes is centered at a 90° angle relative to the circuit board. For the same reasons as set forth with respect to claims 9 and 10, claim 20 is also allowable.

It is respectfully submitted that this Amendment traverses and overcomes the Examiner's rejections to the application as originally filed. It is further submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Reconsideration of the application as amended is requested. It is respectfully submitted that this Amendment places claims 1-20 in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the Applicant's attorney at the telephone number listed below.

Respectfully submitted,

YOUNG & BASILE, P.C.



Michelle L. Knight
Attorney for Applicants
Registration No. 47711
(248) 649-3333

3001 West Big Beaver Rd., Suite 624
Troy, Michigan 48084-3107

Dated: August 8, 2002
MLK/sld

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the specification:

Please replace the paragraph on page 2, lines 5-12 with the following:

A light tube for illumination by a power supply circuit [including] includes a bulb portion and a pair of end caps disposed at opposite ends of the bulb portion. A plurality of light emitting diodes are disposed inside the bulb portion and in electrical communication with the pair of end caps[for illuminating], which diodes illuminate in response to electrical current [to be] received from the power supply circuit.

Please replace the paragraph on page 4, lines 13-32 with the following:

Figure 2 is a perspective view of the LEDs 22 mounted on the circuit board 30. A group of LEDs 22, as shown in Figure 2, is commonly referred to as a bank or array of LEDs. Within the scope of the present invention, the light tube 20 may include one or more banks or arrays of LEDs 22 mounted on one or more circuit boards 30. In a preferred embodiment of the present invention, the LEDs 22 emit white light and, thus, are commonly referred to in the art as white LEDs. In Figures 1 and 2, the LEDs 22 are mounted to one surface 32 of the circuit board 30. In a preferred embodiment of the present invention, the LEDs 22 are arranged to emit or shine white light through only one side of the bulb portion 24, thus directing the white light to a predetermined point of use. This arrangement reduces light losses due to imperfect reflection in a [convention] conventional lighting fixture. In alternative embodiments of the present invention, LEDs 22 may also be mounted, in any combination, to the other surfaces 34, 36, and/or 38 of the circuit board 30.

Please replace the paragraph from page 10, line 26 to page 11, line 3 with the following: ✓

The fourth power supply circuit 400 includes the power source 46 which supplies power to the at least one inductive transmitter 70 in the light tube socket 40. The at least one transmitter 70 inductively supplies power to the at least one receiver 72 in one of the end caps 26 and/or 28 of the light tube 20. The at least one inductive receiver 72 supplies power to the rectifier/filter circuit 50. The rectifier/filter circuit 50, PWM circuit 52, and the one or more

current-limiting circuits 54 operate as described above to power the one or more arrays of LEDs 22. In this manner, the light tube 20 is powered without a direct electrical connection.

In the claims:

1. (Amended) A light tube for illumination by a power supply circuit comprising:
 - a bulb portion,
 - a pair of end caps disposed at opposite ends of the bulb portion, and
 - a plurality of closely-spaced light emitting diodes disposed inside the bulb portion and extending between the opposite ends of the bulb portion, the light emitting diodes in electrical communication with the pair of end caps for illuminating in response to electrical current [to be] received from the power supply circuit.
2. (Amended) The light tube of claim 1 wherein each of the pair of end caps [are] is shaped to be coupled with a fluorescent light tube socket.
3. (Amended) The light tube of claim 2 wherein each of the pair of end caps [are] is an electrical bi-pin [connectors] connector.
5. (Amended) In a replacement light tube for a fluorescent light fixture having a light tube socket and a power supply circuit, the improvement comprising:
 - a plurality of closely-spaced light emitting diodes disposed inside the bulb portion of the light tube and in electrical communication with [the] a pair of end caps [for illuminating] coupled to opposed ends of the bulb portion and engageable with the light tube socket, the, plurality of light emitting diodes operable to illuminate in response to electrical current [to be received from] delivered by the fluorescent light fixture.
6. (Amended) The improvement of claim 5 wherein the plurality of light emitting diodes [are] is mounted to a circuit board.

7. (Amended) The improvement of claim [5] 6 wherein each of the plurality of light emitting diodes [are] is mounted at [a] an angular off-set from the circuit board to establish a predetermined radiation pattern of light.

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